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AMIRDOVLAT' AMASIATS'I: HIS LIFE AND CONTRIBUTIONS

INTRODUCTION

Amirdovlat' Amasiats'i¹ was a late medieval scholar of considerable stature, an important and unusual figure in Armenian as well as universal scientific history. Poised at the very edge of the modern era, he gathered, purified, and organized the medical traditions that preceded him, while adding to them his own numerous contributions. His importance can be explained by his own eminence as well as by the peculiar circumstances of his life. His professional tenure was coincident with the reign of Mehmed II Fatih—an imposing, tyrannical, yet at times remarkably tolerant and enlightened figure, the true founder of the Ottoman Empire, one who went out of his way to select people on the basis of merit, regardless of ethnic or religious background.²

Mehmed II captured Constantinople in 1453, at the age of twenty-one, then enlarged the Ottoman Empire to its essential dimensions while simultaneously setting the organizational lines that would more or less prevail throughout its history.

During the years 1451 to 1481 Amirdovlat' was a practicing physician and an official surgeon at the Ottoman Court, while being a linguist, a traveler, an observer and collector of scientific facts and artifacts, and, finally, a rather rigorous experimentalist at a time when such figures were particularly rare.

BIOGRAPHY OF AMIRDOVLAT'

The Early Years

Amirdovlat' himself has stated that he was born in Amasia but he has not provided the exact date which is taken to be somewhere

AUTHOR'S NOTE: This modest, tentative, and imperfect work is dedicated with gratitude to JACG who, during a chance meeting in the dollar bar of Hotel Armenia, Erevan, and also later, encouraged me, in words and in deeds, to try to make a bit of my heritage accessible to the world.

between 1420 and 1425.³ The colophon of one of his personal books states that he "used to live in the city of Amasia and *later* [emphasis added] he went to Constantinople."⁴ One might therefore reasonably assume that he lived his formative years in the house of his father Eghia (Elias), and might have left Amasia sometime between 1440 and 1445.

Where did he go after that? Another source states, "[Around 1477] a knowledgeable physician was noticeable among the Armenians, one named Amir Dovlat' Amasiats'i who, according to what he himself says, traveled in numerous lands, studied the languages of the Latins, the Greeks, the Assyrians, the Arabs, the Persians, and the Turks. And later [he] came to live in Constantinople in the time of Sultan Mehmed."⁵ It is not unreasonable to speculate that from roughly 1440 to 1450 Amirdovlat' lived in Persia-Mesopotamia (largely overlapping entities at the time), and then in Macedonia, before settling in Constantinople in 1453. These were places where he could learn, improve, and practice his medical knowledge, while also conducting botanical and therapeutic observations and perhaps even experimentations.

Concerning his experiences during these years, Amirdovlat' himself wrote:

I have been through many difficulties and tribulations [at the hands of] the unjust, the foreigners, the judges, the kings and the princes. And I have gathered many books from the Arabs, the Persians, and the Turks. And I wandered extensively. According to the times, I had to put up with the good, the bad, and [all] other events, [being sometimes] rich and [sometimes] poor. And I practiced much medicine in many countries. And I have tested . . . many drugs. . . . And I have attended many sick [people], and the mighty, and the princes, and the [military] . . . and the city dwellers, and the poor. . . . I [also] collected many manuscripts.⁶

This is the rather melancholy and wistful description of the life of a compulsive and ambitious man, moved by his desire to learn, traveling every now and then, according to his means and circumstances, with his many books and few personal belongings, joining a caravan, staying at various caravansaries, and reaching a new city where he could find a job to live by while pursuing his scholarly interests.

The Years in the Service of Mehmed II

Amirdovlat' entered the sultan's employ in 1451, two years before the capture of Constantinople. In all probability he met the sultan in Adrianople.⁷ Indeed, in 1451, Mehmed II left Magnesia⁸ and went to Adrianople to inaugurate his third reign. There, his project to capture Constantinople was met with considerable resistance among the conservative Ottoman nobility. This, together with the remarkable preparations of the siege to come, must have kept Mehmed II quite busy in Adrianople. One then assumes that Amirdovlat', now in his employ,

lived in or around Adrianople from 1451 to 1453. He himself writes, "[First] I went to the world of the Macedonians; then [I] came to live in Constantinople."⁹

Amirdovlat' must have gone to Constantinople after its capture by Mehmed II in 1453. There, he finally found enough stability to allow him to sort his collections, his notes, and his thoughts; to learn more about his trade; and to produce his scientific work. In due course, he received the following titles: Chief Surgeon (Cerrahbaşı), Consulting Physician to the Sultan, and Chief of the Palace Guard.¹⁰ He also had his own private practice. His presence in Constantinople is attested in as late as 1480, in a colophon that reads, "[This book] was copied . . . at the behest of . . . Amirdovlat' the great scientist . . . who night and day concerns himself ceaselessly with scientific topics."¹¹ During these years, roughly from 1451 to 1483, he must have traveled rather extensively in the ever expanding Empire; for example, his "Useful to Medical Practice" was written in Philippopolis,¹² between 1466 and 1469. Perhaps not coincidentally, contemporary accounts relate that [in the winter of 1466], the Sultan [Mehmed II] and his troops resided in Edirne. In the spring [of the same year], the sultan set out with his army from Edirne in the direction of Albania. . . . It was resolved to pass the winter in Filibe. It happened to be a very severe winter, but the time was passed in leisure with feasts. In the spring [of the next year] . . . [t]roops from all all over flowed into Albania and advanced against the enemy. . . . The rebel Iskender . . . fled to the seacoast where he died. . . . When Albania had . . . been completely taken under Ottoman control, the sultan returned to Istanbul.¹³

From the beginning of the Albanian campaign, in 1466, till after the death of Iskender Beg, in 1468, the sultan often resided in Philippopolis and Adrianople. At least part of the time, Amirdovlat' seems to have accompanied his patron during the latter's Macedonian campaigns.

Amirdovlat' seems to have enjoyed the confidence of the sultan, as his several official titles attest. This was not unusual; many Christians and Jews were put in official positions by various sultans, most particularly by Mehmed II who replaced the Ottoman nobility by the *devşirme*.¹⁴ But did Amirdovlat' obtain the ultimate title of Personal Physician to the Sultan? I personally doubt it. All eight of the known personal physicians of Mehmed II were Muslims (Arabs, Persians, and one converted Jew named Yağub), and formed the supreme medical council of the Empire, presided by a Persian practitioner, Kutb al-Din Ajami.¹⁵ Amirdovlat' remained a Christian; and although he was assigned important responsibilities, he simply could not claim the highest title of his profession as long as he would not convert. On the other hand, Amirdovlat' must have had more than a passing intimacy with Mehmed II. Martiros the monk writes, "[Mehmed II] marched against Uzun Hasan and vanquishing him put him to flight

. . . and set on fire the city called [Bayburt] and demolished it. He also captured an excellent and choice Psalm Book and brought it to [Istanbul]; and the medical doctor Amirdovlat' found and delivered this holy book from captivity. This occurred in [1473]."¹⁶ Amirdovlat' was thus able to obtain admittance to the sultan; and he could convince him not to sell but to give away a prized manuscript. This is no insignificant feat; given the austerity and even brutality of Mehmed's rule, his proverbial bad temper, and his purported knowledge and appreciation of artistic and scholarly artifacts.

The introduction to the "Useless to the Ignorant" indicates that this work was finished in 1482 in Constantinople. It is thus probable that Amirdovlat' remained there after the death of his patron in 1481. A colophon of the period states:

Thanks to God this book was finished . . . by the hands of the sinful and worthless, overrated and lazy Antreās, the worthless priest [who is] empty of any goodness, by the will and benevolence of *Khojay* Amirdovlat' the physician, who [has] a keen interest . . . in all philosophical [works]. . . [H]e has translated numerous works from the Arabic and the Persian languages into our own language. . . . He was esteemed and honored by the king of the Muslims and he used to live in the city of Amasia, he went to Constantinople after being called by [Mehmed II Fatih]. And after [the king's] death, his grandson, the Sultan Ahmad, sent for [Amirdovlat'] and brought him to the city of Amasia, where he had been raised, and welcomed him with much affection; at which time I copied this work, for the enjoyment of his learned person. . . . [W]ritten . . . in [1492]. I beg that you remember to God the writer of the above [and] *Khojay* Amirdovlat' the physician, the receiver of this [manuscript] and a mighty writer [himself].¹⁷

Evidently, sometime between 1483 and 1492, Amirdovlat' returned to Amasia, his birthplace. He was still a famous and respected man, since Antreās calls him *Khojay* Amirdovlat', a title that was, at that time, traditionally given to Muslim teachers or high-level court functionaries. How long did he stay in Amasia? What did he do there? The record so far has been silent on these questions. It is known, however, that he died on the 8th of December, 1496,¹⁸ not in Amasia but in Brusa.¹⁹ He must have gone there, as an old man of about seventy to seventy-five years, probably to restore his ailing health or soothe his aching body in that city's famous therapeutic baths.²⁰

THE SCIENTIFIC SOURCES OF AMIRDOVLAT'

For long it has been more or less accepted that Islamic medicine, undoubtedly the principal direct scientific source of Amirdovlat' Amasiats'i, is little else than a derivation of Greek knowledge. According to some, however, the Arabs, through their well-known vast and complex intellectual and commercial network, may have had direct or indirect access to and knowledge of the medical experiences of Sumer,

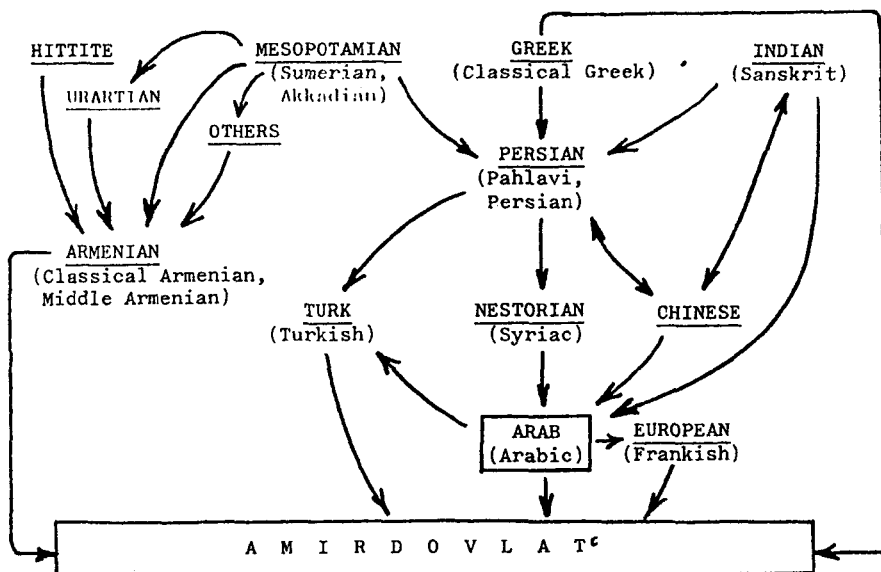


Fig. 1. Known and suspected scientific sources and filiations of Amirdovlat'.

It may be seen that the work of Amasiats'i is syncretic, inasmuch as it brings together various scientific traditions (Anatolian, Mesopotamian, Middle Eastern, Western, and Eastern), but also unifying, inasmuch as it reorganizes these various traditions according to a single set of epistemological principles.

India, and China. This general hypothesis, as yet unproven, assumes that Arabic science could well have been a rather capacious reservoir where vast amounts of knowledge were gathered from a relatively wide geographic distribution—from Greece, Egypt, and Mesopotamia to China—to be later channeled to the rest of the world, and particularly to the Western world. If that is eventually proven to be correct, Amirdovlat' himself would have had indirect access to these same traditions, to which he may have added the more specific Armenian medical font. Figure 1 attempts a schematic representation of the known or suspected, direct or indirect scientific sources of Amirdovlat'.

In any event, Amirdovlat' gathered most of his knowledge through access to the best Arabic chemical, pharmacopeial and medical works. He consulted Avicenna,²¹ Ibn Jazla,²² Rhazes,²³ Maimonides,²⁴ Ibn al-Baytar,²⁵ and other great masters, but he did not hesitate to correct their errors. For example, he states: "[Rhazes] says that . . . the substitute [for this drug] is the root of the Mandragora. But this isn't correct. It's the sap of the Mandragora."²⁶

Arab scientists were greatly inspired by such Greek medical scientists as Hippocrates,²⁷ Theophrastus of Eresus,²⁸ Galen,²⁹ Dioscori-

des,³⁰ and Paulus of Aegina³¹—to cite a few— often through early translations in Syriac, rendered mostly, but not exclusively,³² by Nestorian Christians.³³ Through the Arabs, Amirdovlat' obtained indirect access to Greek knowledge. But he also often writes, "Aristotle says this . . . Galen doesn't believe in this," implying at least an ability to directly access original Greek sources. He may have known the Greek language (classical, demotic, or both) and, certainly after the fall of Constantinople, Greek manuscripts must have been made available to him, particularly since it is claimed that Sultan Mehmed II collected such works. Thus, directly or indirectly, Amirdovlat' assimilated Greek medicine, its cogent parts as well as its dogmatic aspects.³⁴

The earliest known Mesopotamian medical knowledge is contained in Sumerian clay tablets from about 2200 B.C. This proves the early existence of a limited yet objective botany, pharmacology, and chemistry.³⁵ This knowledge either percolated through or got lost in the successive local chronological layers: Akkadian, Assyrian, Babylonian, and Persian. Did Nestorians, Jews, and others, acting as intermediaries between late Mesopotamian and Arabic medicine, have anything Sumerian to transmit to the Arabs, and, through them, to Amirdovlat'? From another viewpoint, could the Assyrians—through trading and warfaring—have influenced Hittites, Urartians, and Armenians? Admittedly, it is impossible at present to answer these questions. But the exceedingly rich synonymatic information provided by Amirdovlat' may be of some help during preliminary forays in these directions.

Nestorians, Jews, and others, also translated important Sanskrit medical works into Syriac,³⁶ and ultimately into Arabic. The Persians and the Arabs had multiple ties—commercial, professional, and cultural—with the Indians and the Chinese, and statistical botanonymic studies of the pertinent scientific texts suggest a significant influence of the eastern Asiatics on the Arabs.³⁷ Through the latter, Amirdovlat' benefited from Indian and Chinese phytomedical knowledge. Even though Amirdovlat' often writes, "and the Indian [masters] say [this]," direct Indian-Armenian contacts in ancient times remain highly hypothetical, albeit historically possible because Indian medicine reached an empiricorational stage just before the postulated formative period of the Armenian nation in Asia Minor,³⁸ and also because Indo-European Sanskrit and the linguistically cognate Indian languages would not be entirely unknown to the Armenians.

The Armenian Highlands occupied a favored botanical position during the prehistoric period,³⁹ with respect to edible as well as medicinal plant species.⁴⁰ The inhabitants of eastern Asia Minor could not entirely neglect the extraordinary floral richness of the region. It may

indeed be revealing that beer, well known by early Armenians,⁴¹ and probably the most common early vehicle for the oral administration of drugs,⁴² is considered by Amirdovlat' to be an aliment and a drug. This hints for a natural sequence of events by which the various inhabitants of prehistoric Armenia⁴³ were able to discover the therapeutic virtues of certain edibles, for example, alcohol-containing drinks.

Was there a specific Armenian medical tradition that may have percolated into the works of Amirdovlat'? There is suggestive evidence in favor of the existence of such a tradition: (i) the common use of simples with the adjective Armenian appended to them (e.g., Armenian natron, or sodium carbonate, Armenian bole), and (ii) the fact that strangers found the Armenian products to be of much higher quality than similar foreign substitutes, thus implying perhaps a longer or more expert evolution of certain pharmaceuticals in Armenia. Obviously, more scholarly efforts are needed to unequivocally establish the actual reality of such a tradition. Be that as it may, it is known that Amirdovlat' did indeed study a great number of specifically Armenian authors.⁴⁴

THE KNOWN SCIENTIFIC CORPUS OF AMIRDOVLAT'

Most of the work of Amirdovlat' follows the scientific Arabic literary format, that is, (i) synonymatic treatises;⁴⁵ (ii) lists of *materia medica*;⁴⁶ (iii) formularies;⁴⁷ and (iv) treatises on any and all medical specialties.⁴⁸ As shown below, there are numerous inconsistencies and uncertainties in the literature as to, for example, the titles, dates of composition, content, and present locations of many of the works of Amirdovlat'. I assume that only a systematic inspection of the extant manuscripts in Erevan, Istanbul, Jerusalem, London, Paris, Venice, and Vienna will be able to resolve this confusion.⁴⁹ In the meantime, I have used the best available information to provide, below, a brief description of all the known corpus of Amirdovlat' Amasiats'i, in chronological order of composition.

The Study of Medicine (Usumn Bzhshkut'ean, written in Constantinople, 1459).⁵⁰ This is the first work of Amirdovlat'; it deals with human anatomy, hygiene, pathology, and pharmacology,⁵¹ and is found with two others,⁵² in Erevan MS 8871. This holograph manuscript⁵³ is dedicated to a certain Shadibeg, son of Vart, apparently an important member of the Armenian community in Constantinople.⁵⁴ Other copies are extant,⁵⁵ and most scholars agree that the work is mostly a compilation of contemporary medical knowledge, and that it is a serious effort, albeit lacking in originality.⁵⁶ And yet, as figure 2

clearly shows, this appears to have been, over the centuries and until recently, Amirdovlat's most widely distributed and used opus.

The [First] Formulary ([Arajin] Akhrapatin, written in Constantinople, 1459).⁵⁷ In this work, large fragments from early Armenian medical texts are excerpted, corrected for perceived errors, and incorporated in the Formulary format, thus vesting it with great historical significance. Since Amirdovlat' has written another Formulary (see *The [Second] Formulary*, below), and since listings of manuscripts rarely distinguish between the two, exact attributions cannot be made without a direct study of the extant volumes, which fall under two practical categories: (i) those that unequivocally contain the [First] Formulary,⁵⁸ that is, the one that was written first; and (ii) those listed as *Akhrapatin*⁵⁹ or as *Akhrapatin (A-K')*,⁶⁰ for which I am unable, at present, to make an exact attribution.

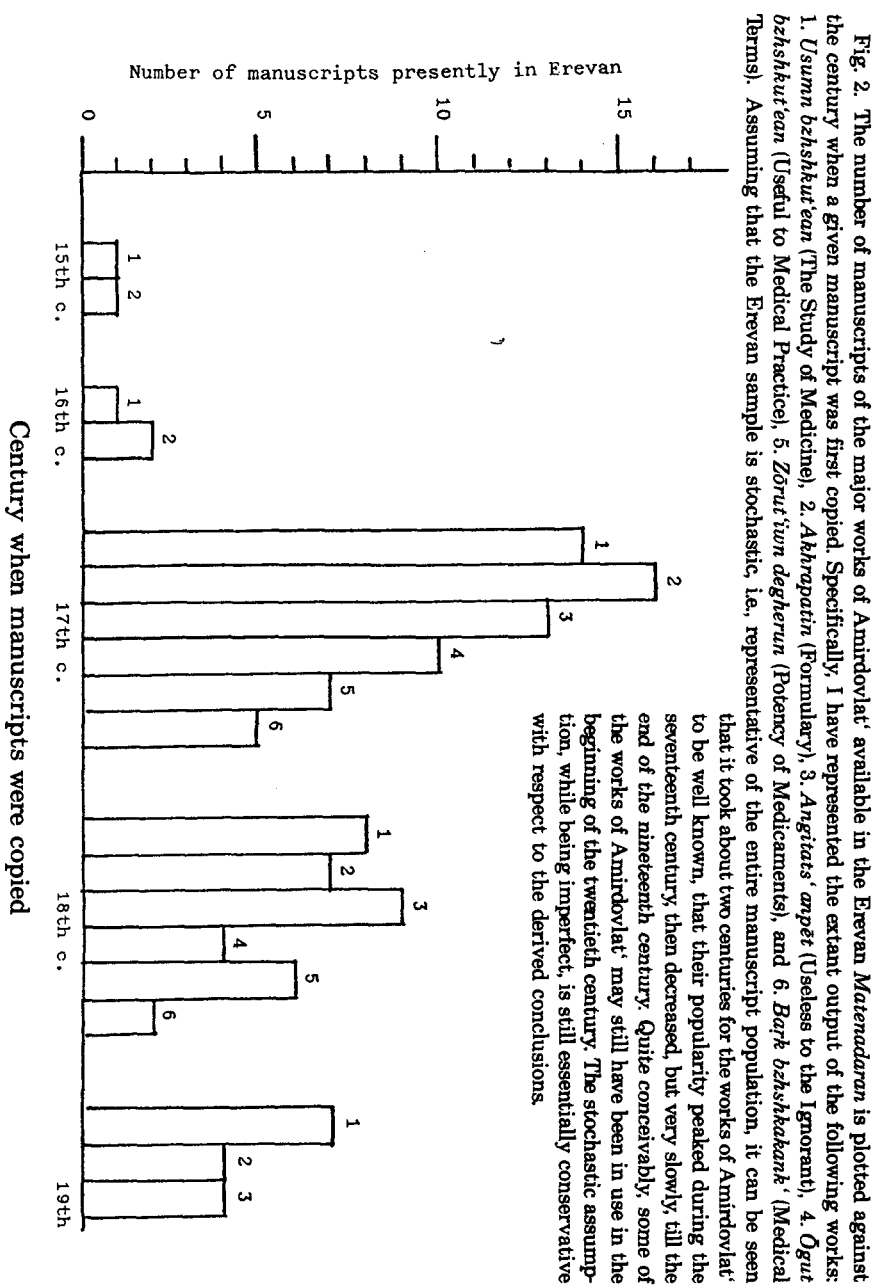
Nomenclature and Commented Presentation of All Ills (Baṛ ew Patmut'iwn Meknats' Amenayn Ts'awots', written in Constantinople, 1459).⁶¹ I have not found any information pertaining to this work, and this can only be remedied through the study of the extant copies.⁶²

Alphabetical Glossary of Illnesses (Baṛk' Aybubenakan i Veray Ts'awots'n, written in Philippopolis, 1468). This is stated to be, despite its title, a short (26 pages) glossary of names of medicaments. It is possible that this work is one, or the other, or both, of the following titles: (i) *Anuank' Degherots'*; and (ii) *Baṛk' Bzhshkakank'* (see *Miscellaneous Other Works*, below).

Diagnosis of Illnesses (Arajadimut'iwn Hiwandin, written in Philippopolis, 1468). This work is listed among the contents of Erevan MS 266⁶³ and is extant in various other copies.⁶⁴ Its colophon reads as follows: "[This] Galen's glossary [*Baṛn Gaghianosi*] was finished by the will of God, [may He be] blessed for eternity, amen! And remember in the Lord the worthless and useless Amirdovlat' the physician, and Christ will remember you in Jerusalem on high, amen. [This] was written on the 22nd of January, a Friday, in the [Armenian] year of 917 [1468] which is [a] leap year."⁶⁵ In all probability, therefore, the work is the same as the one described next.

Glossary of Galen (Baṛn Gaghianosi). Various authors describe, under this probably variant title, a straightforward translation into Armenian of Galen's Greek medical terms.

Useful to Medical Practice (Ōgut Bzhshkut'ean, written in Philippopolis, 1466-1469).⁶⁶ This most important work, edited and printed in



1940, appears to be a recasting of *The Study of Medicine*, amplifying certain important points, adding novel information, and generally improving it. Numerous manuscript copies are extant.⁶⁷ The opus comprises an anatomical and physiological section, followed by a pathological chapter, where detailed descriptions are given of the signs, symptoms, etiology, and therapy of a number of clinical conditions. The latter chapter begins with the description of illnesses affecting the head, then gradually the lower parts of the body, till it describes venereal diseases and, finally, skin disorders. This major effort was not as popular over the centuries as some of the lesser works of Amir-dovlat' (see fig. 2).

Tabular Dictionary (*Aghiwsakerp Bařaran*, written in Philippopolis, 1469).⁶⁸ As the title indicates, this is a very short medical dictionary, in tabular form, usually appended to the work described in the preceding paragraph. Its date and location of composition are based on that assumption.

Book of Vulgarization (*Girk' Ėamkakan*, perhaps written in Philippopolis, 1474).⁶⁹ A mysterious book, whose colophon states: "... translated into Armenian from the Tachik language. . .," thus preventing us from deciding between contradictory statements, that is, that this is a translation from the Turkish or from the Arabic; variously stated to be a work of astrology,⁷⁰ or geomancy, or even to contain "un aperçu de la médecine païenne [pagan medicine] dit[e] Achatarienne."⁷¹

Of the Signs of the Sick, of Life and Death (*Vasn Nshanants' Hiwandin zKenats' ew zMahun*, written in Constantinople, 1474).⁷² This is a short textbook written by Amirdovlat', chief surgeon and eye doctor (*Charahpashi Ėramadanin arareal or ė Amir Dovlat' Amasiats'i*),⁷³ to teach to his pupils some elementary medical and surgical procedures (e.g., phlebotomy, other minor operating procedures, some emergency revival procedures). There appears to be a single extant copy of this work.⁷⁴

The [Second] Formulary (*[Erkrord] Akhrapatin*, written in Constantinople, 1481).⁷⁵ This appears to be a critical translation of the *Aqrabadhin* of Maimonides containing some 2,600 entries,⁷⁶ which Amirdovlat' edited, corrected, and translated, while adding some 1,000 additional entries of his own. This volume comprises three parts:⁷⁷ the first one furnishes much pharmaceutical information (e.g., prescriptions, preparation and stability of various compound formulations); the second one is pharmacological in scope, giving the names, effects, and uses of a great number of drugs; and the last part is a pharma-

copeial dictionary (Armenian-Greek-Frankish-Persian). Again, the listing of extant manuscripts is confusing but can be practically classified as follows: (i) those certainly ascribable to the second Formulary; and again manuscripts listed as *Akhrapatin*, or as *Akhrapatin (A-K')*, for which attributions are impossible without direct scrutiny.⁷⁸

Useless to the Ignorant (Angitats' Anpēt, written in Constantinople between 1478 and 1482). This monumental and remarkable work is presented in greater detail in a separate section, below.

Miscellaneous other works. The available evidence allows me to enumerate the following additional works apparently authored by Amirdovlat': (1) *Names of Medicaments (Anuank' Degherots')*;⁷⁹ (2) *Of All the Master Physicians: A History of Medicaments (Baṛ i Veray Amenayn Bzhshkakan Vardapetats'n Patmut'iwn Vasn Degherun)*;⁸⁰ (3) *Medical Terms (Baṛk' Bzhshkakank')*; and (4) *Potency of Medicaments (Zōrut'iwn Degherun)*.⁸¹ Given the available sources, I cannot delineate the content of any of these works, nor can I be sure that at least some of them are not simply variant titles of some of the works discussed above.

"USELESS TO THE IGNORANT"

Lists of simple drugs were compiled in the earliest known texts, that is, the Sumerian clay tablets. The *Materia medica* of Dioscorides attempts some form of rudimentary classification;⁸² later, Galen discovers the semi-alphabetical classification which the Arabs adopt enthusiastically, improve, amplify and disseminate.⁸³ *Useless to the Ignorant* is a complex and lengthy list of simples, arranged in a somewhat imperfect alphabetical order by name.

Witty titles are rare in medieval textbooks, but they are occasionally encountered.⁸⁴ Amirdovlat' explains it by stating: "[T]he ignorant shall not benefit from this, and therefore we have named this [work accordingly]." The title, however, does not imply an arrogance, since "[T]his book was translated . . . by the hands of the sinful, the useless, and the unwise physician Amirdovlat' of Amasia." The word "translation" should not be taken in its present-day meaning. In the context of the times this implied, certainly in the mind of Amirdovlat', reading, collating, correcting, organizing, editing, and improving upon consulted works in any number of ways.

Useless to the Ignorant is an unusually extensive encyclopedic pharmacopeia, providing more than 3,700 entries of names of medica-

ments of mineral, botanical, and animal origin, while also listing their effects, uses, and toxicities. It is based on Arabic and, indirectly, Greek medicine. It often refers to Armenian as well as non-Armenian physicians.

The Herbal Pharmacopeia

Extending earlier efforts,⁸⁵ I have now tentatively identified by their scientific binomen some 540 plants whose medicinal properties are presented in this work, and which are named by their pre-Linnean Arabic, Armenian, Frankish (or pre-French if you will), Greek, Latin, Persian, or Turkish common names.⁸⁶ Needless to say, these initial identifications need to be confirmed, to the extent possible, through a joint effort with interested comparative philologists and botanists. It is surprising to discover that even by a conservative estimate, at least seventy-five percent of these plants are still in use in Africa, Asia, and Europe.⁸⁷ The later discovery of the extremely rich American tropical flora did not significantly affect the use pattern of these traditional medicinal plants of the Old World. This also explains why this work was used by Armenian practitioners up to the end of the nineteenth century (see fig. 2). I am now in the process of translating into English the medically significant portions of this work, including its anatomical, medical, and pharmacological terms, and of interpreting the text in light of modern knowledge in medicinal chemistry, clinical pharmacology, and experimental therapeutics. A few representative portions of the work's contents are offered below.

Examples of the Scientific Respectability of Amirdovlat'

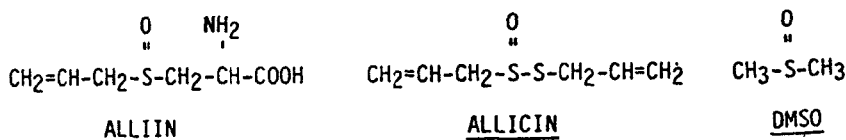
Allium cepa.—Amirdovlat' says, "Let us remember the onion which possesses . . . a refreshing nature and the power to burn. And upon boiling, these two effects are separated one from another."⁸⁸ We know today that when an onion is cut, the enzyme allinase is liberated to immediately produce the lacrymatory principles of the onion; but the enzyme may be denatured by heat.⁸⁹ Amirdovlat' knew that boiling destroyed certain properties of onions to the exclusion of others.

Allium sativum.—"Be it cultivated or wild," says Amirdovlat', "the good [garlic] is [the] one having a big head. . . . For teeth that have pain [i.e., odontalgia], the [garlic] helps. And if you mix it with vinegar and rub it on the ringworm [i.e., *Tinea*], it helps. And it kills the louse [i.e., *Pediculus hominis*]. And it will get rid of the blackness that exists all round the eyes. And the man that takes an aphrodisiac without finding [sexual] appetite, it will bring it out. And the one that

is wild helps neuralgia due to the cold [or humidity?]. And it clears the voice. And it helps the cough due to the [presence] of phlegm. And it removes the [intestinal] worms and the snake [*Tenia?*]."

"And it encourages," continues Amirdovlat', "the [flow of] the menstruum [i.e., it is an emmenagogue] and the [production of] urine [i.e., it is a diuretic]. And it removes the friend of the child [i.e., the placenta] from the womb. And it helps backaches and will increase [sexual] appetite. And it gives a bright and [healthy] red color to people. And it will help the [distended] spleen [i.e., splenomegaly]. And it will help cold tumors. And to those bitten by venomous beasts and snakes, and to those having caught a rabid dog, and to [those] individuals desirous of vomiting water [?], it is good. . . . But it weakens the eyes and gives headaches. And its bad effects are canceled by vinegar."⁹⁰

GARLIC (*Allium sativum*)



Antimicrobials:

Alliin

Allicin

Muscle contractants:

Prostaglandin A₁

Other prostaglandins?

Anthelmintics:

Allyl sulfide

Diallyl disulfide

Allylpropyl disulfide

Diuretics:

Fructosans

Antalgics:

DMSO analogues?

Fig. 3 The upper panel compares the structures of the garlic components alliin and allicin to the known antalgic dimethyl sulfoxide, or DMSO. The lower panel compares therapeutic categories recognized by Amirdovlat' (left column), to the chemical principles known or suspected today to possess these activities (right column). Some of the comments of Amirdovlat' may also concern the wild garlic, *Teucrium scordium*.

In figure 3 I present the formulas of two of the most important chemical moieties present in garlic: alliin and allicin; next to them I give the formula of dimethyl sulfoxide (DMSO), an antalgic not present in garlic, to emphasize its structural similarities with alliin and

allicin. The figure also lists five therapeutic categories containing most of the interpretable uses of garlic provided by Amirdovlat'. Alongside each category I list the substances known or postulated to exist in garlic which possess these effects. It is obvious that most of the notations of Amirdovlat' are essentially validated by modern science. To this day garlic is used in Europe, Africa, and Asia for much the same reasons prescribed by Amirdovlat'. In China, it is considered to be beneficial to the spleen; and it is applied on abscesses, insect and snake bites, and scorpion stings.⁹¹ In India, garlic is used in the treatment of abdominal tumors. It was shown recently that mice inoculated with sarcoma (a highly malignant tumor) but treated with garlic extracts stayed alive for the entire observation period of 6 months but the untreated control group died in 16 days.⁹² Millennia ago Egyptians appear to have used garlic to cure indurations, that is, cold tumors.⁹³ A recent work states, "The isolation of potent prostaglandins . . . further supports the speculation that [garlic] possesses considerable potential . . . [therapeutic] value."⁹⁴ All this illustrates the extraordinary movement of medical information in the Old World throughout the ages. It also shows that the recognition of many as yet unutilized efficacious treatments⁹⁵ is hampered by certain biases of the scientific and industrial world.

Conium maculatum.—"The good [poison hemlock]," says Amirdovlat', "is the fresh one. It is narcotic. It inebriates people and it brings sleep. And its juice removes the freckles from the face. And if you use it topically, it won't allow the breast to get big, and it will release milk in some amount. It releases the menstrual flow [while being] hemostatic. And it helps hot tumors. And it will evacuate the yellow bile. If one would pull the hair and in its place rub poison hemlock, or apply a poultice, hair will not grow [any more] on that spot. And it helps the acute gout [episode]. And it will shorten the measles. It dries out the milk. Its ill [effects] are negated by the [—] wine. If you rub [with it] the covered organ [i.e., the penis], it will make it weak and limp. And the master doctors have said that one should not either eat or drink from that plant, for it maddens and kills people."⁹⁶ The poison hemlock is now known to contain coniine and other less effective toxic principles that cause weakness, drowsiness, nausea, vomiting, labored respiration, paralysis, asphyxia, and death.⁹⁷ In lower, that is, therapeutic, doses it is an antispasmodic;⁹⁸ the mild dizziness and weakness produced at such doses may mimic inebriation, while mild drowsiness and muscular relaxation would induce sleep. Again, the observations of Amirdovlat' are consistent with current scientific knowledge. They also suggest newer uses for this plant, for example, female hirsutism or excessive pilosity.

AMIRDOVLAT', SCHOLAR AND SCIENTIST

The Linguist and the Encyclopedist

Amirdovlat' was, first of all, an encyclopedist. Given his linguistic abilities, he was able to understand and translate many of the major scientific works available to him. He approached his task with originality. First, he critically assessed the books of his predecessors on the basis of his own empirical and experimental observations. Second, he contributed to the legacy he inherited.

The Botanist and the Toxicologist

In his *Useless to the Ignorant*, copies of which are available in many locations,⁹⁹ Amirdovlat' says: "[This plant] grows in the country of the Greeks, as well as in Macedonia and all around Constantinople, and also on the shores of the Black Sea. [I have] found it in the rural areas around Constantinople."¹⁰⁰ This quotation illustrates the direct and hands-on approach of Amirdovlat'. He went out constantly in the field, in all places that he lived in or traveled to, in order to observe by himself the botanical specimens of interest to him. Now, let us quote the toxicologist in him: "As often as I have tried [this plant], it will not harm humans. It is harmless by the will of God."¹⁰¹ And elsewhere: "[This] fruit is slightly sweet, and [Ibn Jazla] has said that it is very bitter. This is not so."¹⁰² Indeed, his *Useless to the Ignorant* is replete with the statement that "[This author] has said this, and this is not correct . . . [but that other author] has said this, and his word is honorable." We are clearly dealing here with an experimentalist who will reject what is erroneous or unfounded, and who will accept what is correct, regardless of irrelevant considerations, for example, popularity, fame, or authority.

The Physician

In his masterwork *Useful to Medical Practice*, his clinical breadth and depth are apparent. After presenting a great number of illnesses he is able to recognize their acute and chronic forms. In that opus, some twenty headings are concerned with ophthalmological conditions while some fifteen chapters are devoted to otorhinolaryngological illnesses. In the gynecological and obstetrical sections he describes the uterus, its functioning and role during pregnancy and delivery, the perturbations of the menstrual cycle, the swellings and sores of the genital organs, and even the postulated causes of infertility. He even discusses a number of psychological and psychiatric disorders, such as mania, delirium, melancholy, depression, insomnia, and epilepsy.¹⁰³

The Pharmacologic and Therapeutic Concepts of Amirdovlat'

Amirdovlat' exhibits astonishingly modern views when it comes to defining what a drug is or to identifying the various developmental stages that a medicinal preparation has to go through before being recognized as a useful therapeutic agent. In essence, his fundamental concepts on these matters are very similar to the basic precepts and practices of the U. S. Food and Drug Administration in its efforts to oversee the investigation of new drugs, before eventually approving them for general use.¹⁰⁴

The definition of drugs.—Following in the footsteps of Theophrastus and Galen, Amirdovlat' says: "Whatever [ingestible] . . . that God has created is either a food, or a medicament, or is injurious by changing the nature of the human and by killing him."¹⁰⁵ Having thus distinguished three types of ingestibles—foods, medicaments, and toxics—he goes on to define each one in practical terms, by contrasting and opposing them to one another. Anything that harms or kills is obviously a toxic substance, that is, neither a food nor a drug. Then Amirdovlat' accepts that certain ingestibles are, simultaneously, food and drug, for example: "Beer . . . is recognized as medicament and food."¹⁰⁶ What about edibles that are positioned at the blurred frontier between food and drug,¹⁰⁷ where distinctions can sometimes become very difficult to assess? Amirdovlat''s answer to that challenging question, although not entirely original,¹⁰⁸ is nevertheless entirely lucid: "The difference between a food and a medicament is that the human being takes control over the food while the medicament takes control over the human being."¹⁰⁹ In other words, the human body is in full control of the situation when the relatively bulky foods are ingested, digested, and metabolized for the purpose of generating vital energy; on the other hand, the usually small amounts of administered drugs penetrate the body and forcefully affect certain of its functions until they are disposed of.

Chemistry and manufacturing controls.—The successful preparation of acceptable drugs, either bulk or formulated, depends on the availability of good concepts as well as adequate technology. The latter was, of course, most rudimentary in the fifteenth century, and Amirdovlat' had, for example, to rely on rather insensitive endpoints (taste, color, odor) as specifications for the release of his preparations. On the other hand, the concepts that he used are as good as ours: That rigorous manufacturing rules should be followed to avoid obtaining useless or even harmful products, and that the potency and stability of a final formulation should be defined as well as practicable. These concepts

are embodied in pragmatic instructions: When and where to harvest a given plant, how and how fast to dry it, which wet or dry extraction procedure to follow, and so on. These concepts and other information are provided by Amirdovlat' sometimes in excruciating detail.

Preclinical studies.—The importance of the observation of animal behavior seems to have been well understood by Amirdovlat', as attested in the following excerpt: "The swallow whose eyes are hurt . . . goes and obtains [this] herb, and onto his eyes . . . he rubs it[,] and . . . his condition is improved."¹¹⁰ Amirdovlat' may even have used formal animal experimentation and, at any rate, understood the importance of extrapolation of data from animals to humans. For example, he has said, ". . . and there are medicaments . . . [whose effects] have been observed and studied on animals . . . and later they were tested [in humans] and found to be effective."¹¹¹

Clinical trials.—Amirdovlat' has made the simple and straightforward statement that "I tested . . . many drugs. . . . The understanding of the nature of drugs is brought about by trials."¹¹² He insists that a drug is to be tested in a single clinical condition. "A given drug should be tested for one ailment. It shouldn't be tested for two ailments [for] it might improve one [ailment] and not improve the other, [in which case] one is confused as to what its effect has been." He also carefully emphasizes the notion of dose adjustment when he says: "What is the intensity of the fever of this patient? Therefore give him [the amount of] drug [needed] to meet the intensity."¹¹³ He finally recognizes differences of sensitivity in different individuals by saying, ". . . a [given] drug may have [one] effect . . . on the young man . . . and [the opposite] . . . in old people."¹¹⁴

CONCLUSIONS

Assessment of the Contemporary Usefulness of Amirdovlat'

In the sciences.—Historically, the recognition of medicinal plants goes through cycles of alternating acceptance and rejection. The last rejection began in the eighteenth century while, recently, the pendulum has slowly begun to swing in the opposite direction. As a result, attention is being again directed toward ethnofolkloric data and ancient empirical pharmacopeias. The efficacy and safety of old medicinal plants are being tested and validated more and more frequently, even during comparisons with potent modern synthetic drugs.¹¹⁵ It would seem that the world is at last ready to appreciate the work of Amirdovlat'.

In the humanities.—Even though the importance of the humanities is being currently rediscovered, learned circles are still in need of tangible ways of convincing the population of the so-called relevance of the humanities to our technologically oriented world. I submit the *Useless to the Ignorant*, for example, as an intellectually challenging and socially useful focus of interdisciplinary collaborative studies by humanists and scientists, particularly in the following complementary areas: (i) botanical and botanonymic inquiries; and (ii) attempts to rediscover plants possessing potentially beneficial therapeutic activities.

The Limitations of Amirdovlat'

Despite its numerous contributions to the progress of the medical arts, "Galenism greatly narrowed ancient traditions: where there had once been a lively debate, now there was a single strong voice."¹¹⁶ Later, even though "medieval pharmacology added considerably to [classical] materia medica ([e.g.] hundreds of names of simple and compound drugs, not known to the Greeks, were added from Persian and Indian sources),"¹¹⁷ Islamic medicine offered a muted refutation but not a clear repudiation of Galenic dogmatisms and "stark schematisms."¹¹⁸ Amirdovlat' retained this medieval behavior; consequently, he was not able to boldly advance the cause of medical progress: his ideation was not of sufficient originality, and he did not possess technologies novel enough to allow him to serendipitously even shatter the old molds. But, to be fair, neither did anyone else till post-Renaissance Europe performed that difficult task, over an incredibly lengthy gestational period during which vast resources were made to bear; this, despite the enormous hold of obscurantism, itself illustrated by the somewhat simplified account of the persecutions faced by Philippus Theophrastus Bombastus von Hohenheim, otherwise known as Paracelsus, when, in sixteenth-century Basel, he dared burn the books of Galen in the defiant gesture of the reformist. By that time, Vesalius, a conscious Galenist, had nevertheless already begun undermining certain Galenic tenets. Later, Harvey—probably a bona fide Galenist himself—finally exposed the glaring error of the ancient master.

The Strength of Amirdovlat'

The Amasiats'i, through his lucid and painstaking efforts, concentrated in his work most of what was best in pre-Renaissance knowledge. He crystallized in his work some 3,600 years of written medical know-how. And that mostly clean slate is now available to his posterity. In that context, it can be seen that Amirdovlat' is neither an ethno-

folklorist nor a simple empiricist. He is an empirical scientist who went remarkably far, given the limited technological tools of his time. He accomplished this with the help of a surprisingly modern personal set of epistemological principles, themselves rather difficult to discern inasmuch as they are well hidden within the thick folds of his corpus. On that basis, it can be safely stated that he was a major scientific figure of premodern medicine. The science and art of therapeutics was the central concern of Amirdovlat' while everything else—philology, botany, mineralogy, zoology, anatomy, physiology, hygiene, pathology, and the various clinical disciplines such as gynecology, obstetrics, otorhinolaryngology, arthrology, dermatology, venereology, gastroenterology, hematology, parasitology, and psychology—appear to have occupied an important but secondary position in his mind. The very definition of his central and peripheral interests helps to emphasize the disciplined and organized nature of his scientific pursuits.

Quality among decadence

After its golden age, which lasted roughly from the eighth to the tenth centuries, Arabic medicine began to decline and, later, suffered considerably during the Mongol invasions of the fourteenth century. It is against this background that the contributions of Amirdovlat' can be appreciated even more. We can compare his works to, for example, a medical treatise dated 1465, written by Sharaf al-Din Ibn Muhammad, nicknamed Sabuncu Oğlu (The Son of the Soapmaker), chief physician of the hospital of Amasya, entitled *Jerrahiya wa Ilhaniya*. A contemporary author makes the following admission about that work: "This treatise . . . [which] was . . . presented to the sultan [Mehmed II] . . . [and which] is available . . . in Paris . . . I studied and compared with the famous opus of Abu al-Kasim Zakrawi [*al-Tashrif*] [and] found out that the Turkish author has literally translated the latter into Turkish."¹¹⁹ Sabuncu Oğlu was still a relatively honest practitioner but many of his contemporaries specialized in talismans, incantations, occultism, and other forms of reputable or disreputable quackery.

Influence on Armenians

Apparently, all of the contributions of Amirdovlat' were written only in Armenian. The reason may be contained in the following quotation: "And up to this day . . . there was a void among us [Armenians] as to [the knowledge] of drugs. And for this reason, we became dependent on foreigners."¹²⁰ Amirdovlat' wanted to break that dependence, and

figure 3 shows that he has been, for more than four centuries, at least partly successful in that endeavor. Even as we admire it, we must also admit that his decision has diminished considerably his importance—a fact that is now in our power to correct.¹²¹

Overall Assessment

Amirdovlat' remains, to this day, worthy of a renewed attention and a more intense scholarly scrutiny, from humanists and scientists alike. This peculiarly Armenian scholar possesses a broad and universal appeal to anthropologists, Armenologists, botanists, historians, orientalists, pharmacognosists, pharmacolinguists, pharmacologists, and physicians, providing them with an opportunity to engage in exciting and useful collaborative ventures. I shall hazard to guess that there is much to be rediscovered, scientifically, historically, and philologically, in the works of Amirdovlat'.

FOOD AND DRUG ADMINISTRATION
ROCKVILLE, MD.

NOTES

1. All personal and geographical names, when in Armenian in the quoted sources, are given in the original spelling. The name Amirdovlat', and other Armenian personal names, are spelled according to the Library of Congress transliteration system. Additional useful spellings are provided in notes.

2. The name Amasiats'i is from Amasia, present-day Amasya, in northern Anatolia, on the Yeşil Irmak or Iris river; ancient Amaseia, capital of the kings of Pontus; incorporated in the Ottoman Empire by Sultan Beyezid I, 1398-1402. See *Encyclopaedia Britannica* (Chicago, 1983), I:291; and J. Murray, *Handbook for Travellers in Turkey in Asia* (London, 1878), p. 421.

3. H. Achařian, *Hayots' andznanneri bařaran* (Beirut, 1972), 1:125; and Murray, *Handbook*, p. 421.

4. Y. J. Siruni, *Bolis ew ir derě* (Beirut), 1:269-270.

5. M. Ch'amch'ian, *Patmut'iwn hayots'* (Venice, 1786), 3:508.

6. Siruni, *Bolis*, p. 265; the introduction of the "Useless to the Ignorant," dated 1478.

7. Originally Uskudama, then Hadrianopolis; present-day Edirne in European Turkey; capital of the Ottoman Empire from 1413 to 1458 (*Encycl. Brit.*, III: 790-791).

8. Magnesia ad Sipylum, i.e., lying below Mt. Sipylus, in the valley of Gediz or Hermus river; originally Magnesiopolis, present-day Manisa; conquered by the Ottomans in 1390, lost in 1402, retaken by them ca. 1410 (*Encycl. Brit.*, VI: 569). Teen-aged Mehmed II lived there, after he reluctantly abdicated his throne, with his tutor Zaganos Beg, an Albanian Christian in origin, during the entire second reign of his father (H. Inalcik and M. Rhoads, trans., *The History of Mehmed the Conqueror*, by Tursun Beg [Minneapolis, Minn.: Bibliotheca Islamica, 1978], p. 32).

9. Written in the introduction to his "Useless to the Ignorant" (K. Y. Basmajian, ed., *Amirdovlat'i Amasiats'woy Angidats' Anpēt* [Vienna, 1927], p. 3.

10. Stated to be recorded in Bibliothèque Nationale de Paris MS 247 (G. M. Enézian, *Les connaissances médico-pharmaceutiques de l'Antiquité et du Moyen-Age à travers les manuscrits arméniens* [Rheinfelden: Edition Enézian, 1982]). I have not personally consulted this, or any other manuscript, and the above referenced author does sometime make erroneous statements. E.g., "L'Akrabadine d'Amirdovlate (1481). .enregistrée sous le No. 8871 au Matenadaran (sic) (Enézian, *Les connaissances*, p. 80; however, Erevan MS 8871 is dated 1459; see Ō. Eganyan, *Ts'uts'ak dzeagrats' Mashtots'i anvan Matenadaran*, Vol. 2 [Erevan: ASSR Academy of Sciences, 1970], p. 827); " . . l'unique exemplaire [de] l'Étude de la médecine . . se trouve au Matenadaran" (Enézian, *Les connaissances*, p. 80; but there are, of course, a great many extant copies of this work in Erevan); *Mots et récits concernant tous les maux*, manuscript No. 419 au Matenadaran" (Enézian, *Les connaissances*, p. 84; in fact, Erevan MS 419 is a miscellany copied by the deacon Grigor in 1777, comprising various works, none of them by Amirdovlat'; see Ō. Eganyan, *Ts'uts'ak dzeagrats' Mashtots'i anvan Matenadaran*, Vol. 1 [Erevan: ASSR Academy of Sciences, 1965], p. 316).

11. The book was a Psalter written by a certain monk Martiros; see V. Y. T'orgomian, "Amirdovlat'ay saghmosē," *Handēs Amsoreay* (August, 1895), p. 274.

12. Originally Pulpudeva, then Philippopolis (after Philip II of Macedonia); later Trimontium under the Romans; present-day Plovdiv, second city of Bulgaria (*Encycl. Brit.* VIII:48). Turkish authors called it Filibe (Inalcik and Rhoads, *The History*, 124b).

13. This account is given by Tursun Beg in his *Tarih-i Abul-Fath* (The History of Mehmed the Conqueror); see Inalcik and Rhoads, *The History*, pp. 55-56.

14. The Turkish word *devşirmek* means to collect. The word *devşirme* denotes the roughly quinquennial levy of Christian boys, 10 to 20 years old, mostly from the Balkans, but also from Armenia, who were then converted to Islam (since only Muslims could rise to high Ottoman office), and educated to function either as civil servants or as elite soldiers, i.e., the Janissaries. The practice had socially repressive consequences as far as the Christians were concerned (having a debilitating effect similar to that of slavery on Africa and the Africans), but had liberalizing political effects—at least initially—on the Ottoman Empire itself, by curbing the powers of the old conservative Ottoman nobles, essentially by replacing them by these converted Christian slaves of the sultans (*Encycl. Brit.* III:507). The latter political ploy, used masterfully by Mehmed II, is connoted in the historical expression *devşirme system*.

15. A. Adnan, *La science chez les turcs Ottomans* (Paris: G.-P. Maisonneuve, 1939), pp. 38-39.

16. A. K. Sanjian, *Colophons of Armenian Manuscripts* (Cambridge: Harvard University Press, 1969), pp. 325-326.

17. Erevan MS 1921 (Eganyan, *Ts'uts'ak I*, pp. 675-676), written in Amasia by Antrēas, commissioned by Amirdovlat' himself, containing various philosophical writings and commentaries. The colophon is reproduced in Siruni, *Bolis*, p. 270.

18. K. J. Basmadjian, "Les anciens ouvrages arméniens sur la médecine," in *Comptes Rendus du IIème Congrès International d'Histoire de la Médecine* (Paris, 1921), p. xvii; and Acharian, *Hayots'*, p. 128.

19. The ancient Prusa of Bithynian kings, along the foothills of the Mysian Olympus, present-day Ulu Dağ; retaken and renamed Brusa by the Ottomans in 1324. It was the Ottoman capital until 1413 when the seat of government was moved to Adrianople, and then to Constantinople-Istanbul. Presently, it is called Bursa (*Encycl. Brit.* II: 392-393).

20. "The Baths of Brousa . . . are much frequented by invalids from Constantinople. . . . They are handsome structures, containing a number of apartments, and

fed by both hot and cold springs, some chalybeate, others sulphurous" (Murray, *Handbook*, pp. 132-133).

21. Abu 'Ali al-Husayn Ibn 'Abd Alah Ibn Sina (980-1037), author of the *Al-Qanun fi'l tibb* (The Canon of Medicine) (M. Levey, *Early Arabic Pharmacology* [Leiden: E. J. Brill, 1973], p. 125 n. 4; and A. Z. Iskandar, *A Descriptive List of Arabic Manuscripts on Medicine and Science at the University of California, Los Angeles* [Leiden: E. J. Brill, 1984], pp. 65-67). Amirdovlat' calls him "Sinayi ordin" (the Son of Sina), and "Sheikh Rayis" (the Elder Master). For authoritative presentations of Arabic medicine and its practitioners consult the following sources: M. Ullmann, *Die Medizin im Islam, Handbuch der Orientalistik*. Abt. 1, Ergaenz. 6. Abs. 1 (Leiden: E. J. Brill, 1970); idem, *Islamic Medicine* (Edinburgh University Press, 1978); F. Sezgin, *Tarikh al-turath al-'Arabi*, vol. 1, pt. 1 (Cairo, 1971); idem, *Geschichte des arabischen Schrifttums*, vol. 3, *Medizin, Pharmazie, Zoologie, Tierheilkunde bis ca 430 H* (Leiden: E. J. Brill, 1970), and G. Majno, *The Healing Hand: Man and Wound in the Ancient World* (Cambridge, Mass.: Harvard University Press, 1975), particularly the bibliography, pp. 425-469.

22. Abu 'Ali Yahia Ibn 'Isa Ibn 'Ali Ibn Jazla al-Baghdadi (11th century), author of *Tuqwm al-Abdan fi tadbir al-insan* (Treatment by Regimen) (Iskandar, *A Descriptive List*, p. 80). He also wrote *Minhaj al-bayan fima yasta'miluhu'l-insan* (Manual of Explanation in What One Employs) (Iskandar, *A Descriptive List*, p. 55; and Levey, *Early Arabic Pharmacology*, p. 59); consequently, Amirdovlat' calls him "Minhachin tere" (The Master of the Minhaj), see Basmajian, *Amirdovlat'i*, p. 34.

23. Abu Bakr Muhammad Ibn Zakariyya al-Razi (865-925), author of *Al-Mansuri fi'l tibb* (The Medicine of al-Mansur) (Iskandar, *A Descriptive List*, p. 53); of *Al-Hawi* (ibid. p. 61); and also of an *Aqrabadhin* (Formulary) (Bodleian MS I, 611; Levey, *Early Arabic Pharmacology*, p. 74). Amirdovlat' calls him "Razkann ordin" (The Son of Razi), "Zak'ariayi ordin" (The Son of Zakaria), "Razi", "Razik" (Little Razi, connoting affection and familiarity), and "Haviin tern" (The Master of *al-Hawi*). Rhazes was a formidable figure in medieval medicine, reputedly the first doctor to portray smallpox (A. M. Behbehani, "Rhazes, the Original Portrayer of Smallpox," *Journal of the American Medical Association*, 252 (1984), 3156-3159; but see also Sezgin, *Geschichte*, s.v. "Thabit Ibn Qurra": Rhazes differentiated smallpox from measles, but was not the first one to describe smallpox).

24. Abu Imran Musa Ibn 'Obaid Allah Ibn Maymun (1135-1205), author of an *Aqrabadhin* (Basmajian, *Amirdovlat'i*, p. xiii).

25. Diya al-Din Abu Muhammad 'Abd Allah Ibn Ahmad al-Andalusi al-Malaqi Ibn al-Baytar (1197-1248), author of *Kitab al-Mughni fi'l-adwiya al'mufrada* (The So-Called Sufficient Book) (Basmajian, *Amirdovlat'i*, p. xiii); Levey, *Early Arabic Pharmacology*, p. 170; and Iskandar, *A Descriptive List*, p. 55; Bibliothèque Nationale de Paris MSS 5777, 6623.

26. Basmajian, *Amirdovlat'i*, p. 53. We prefer the term "Mandragora" to "Mandrake" since the latter is in the United States the alternative common name of the mayapple (*Podophyllum peltatum*), to be differentiated from the European Mandrake, a species of *Mandragora* in the potato family.

27. Hippocrates of Cos (ca. 460-ca. 377/360 B.C.); in his medical works, which were popularized by Galen, very few drugs are recommended. For authoritative presentations of Greek medicine and its practitioners consult the following sources: Wesley D. Smith, *The Hippocratic Tradition* (Ithaca, N.Y.: Cornell University Press, 1979); J. M. Riddle, *Dioscorides on Pharmacy and Medicine* (Austin: University of Texas Press, 1985); and Majno, *The Healing Hand*.

28. Theophrastes of Eresus in Lesbos (ca. 372-ca. 288/287 B.C.), "[o]ne of the great botanists of all times" (Levey, *Early Arabic Pharmacology*, p. 19); some of his works were translated into Arabic but only late in medieval times, and, therefore could not influence early Islamic scientific knowledge.

29. Galen, or Galenus, or Galenius of Pergamon or Pergamum (ca. 130-ca. 200). "Galen conceived of all things as composed of the four *elements* of fire, earth, air, and water, embodying the four *qualities* of hot, cold, dry and wet [respectively]. Food and drink [also] consisted of these basic elements . . . [and in the body] were transformed . . . into [four] *humors* . . . : blood, phlegm, yellow bile, and black bile. Air corresponded to blood, which is hot and wet; water to phlegm, which is cold and wet; fire to yellow bile, which is hot and dry; and earth to black bile, which is cold and dry. . . . Galen believed that the bodily parts and their actions resulted from varying combinations of these four elements, qualities and humors. The . . . proper . . . blending produced health [i.e., t]he equilibrium of the four qualities . . . created well-being. . . . The etiological agent [of illnesses] was thus considered to be . . . a change of humor" (M. W. Dols, *Medieval Islamic Medicine: Ibn Ridwan's Treatise on the Prevention of Bodily Ills in Egypt* [Berkeley, Calif.: University of California Press, 1985], pp. 10-12). For more insights into the Galenic system see also R. Klibansky et al., *Saturn and Melancholy* (New York, 1964), pp. 3-15), and R. E. Siegel, *Galen's System of Physiology and Medicine* [Basel, 1968], pp. 211-216).

30. Pedanius Dioscorides of Anazarbus in Cilicia (ca. 40-ca. 90), author of *De materia medica* (Medical Substances, i.e., drugs); "now recognized as the greatest and most original Greek pharmacologist . . . [He wrote] one of the most influential pharmacological textbooks ever known" (Levey, *Early Arabic Pharmacology*, p. 21); but "the old notion that Arabic pharmacology is an almost complete version of the Greek knowledge, especially that of Dioscorides, must be radically modified" (ibid., p. 63); finally, "the *Materia medica* of Dioscorides . . . in the hands of the Arabs . . . overcame the rigidity of the earlier Mesopotamian lexical lists" (ibid., p. 25).

31. Paulus of Aegina (ca. 625-ca. 690), author of *Epitomes iatrikes biblio hepta* (Medical Compendium in Seven Books), from which Rhazes, for example, drew extensively.

32. For example, Hunain Ibn Ishaq (9th century) "translated the entire Galenic corpus into 100 Syriac . . . treatises[; he] also translated [the] *Seven Books* of Paulus of Aegina, Dioscorides' *Materia medica*, and many other important books (Levey, *Early Arabic Pharmacology*, p. 31; consult also M. Meyerhof, "New Light on Hunain Ibn Ishaq and His Period," *Isis* 8, 4 [1926], 685-724).

33. The followers of Nestorius, patriarch of Constantinople, condemned as heretics by the Council of Ephesus in 431; they found refuge in Edessa (present-day Urfa), which they were forced to leave in 489, to seek further refuge first in Nisibis, and then in Jundishapur, Persia, a cultural capital where Sanskrit and Greek texts were translated into Persian, then into Syriac (Levey, *Early Arabic Pharmacology*, pp. 30-31). The pervasive and osmotic nature of the Nestorian influence on the Arabs is illustrated by the statement of al-Nasir al-Hakim 'Abd al-Jabbar that the original version of the book entitled *al-Hikma al-Ilahiyya* (The Divine Wisdom) was written in Syriac and was found in an earthenware vessel that was discovered when a wall in his father's house was accidentally demolished (Iskandar, *A Descriptive List*, p. 48).

34. Some modern medical practitioners have claimed that this dogmatism put medical knowledge in a carcanet well into the 18th-19th centuries when, in succession, Giovanni Battista Morgagni, Xavier Bichat, and Rudolf Virchow, and others, ascribed disease to lesions of, respectively, organs, tissues, and cells. In the last few decades, we have just begun to explain diseases on the basis of molecular abnormalities. Many medical historians do not agree with this harsh judgment, arguing perhaps that the fundamental concepts of Galen constitute the categorical foundations of medical knowledge and are thus beneficial, particularly when one ignores some of their artificial symmetries. Nevertheless, a typical example of damaging dogmatism is provided when miasmata are offered as the principal reason of bacterial and viral epidemics to the almost exclusion of contagion as one of its leading causes. Other erroneous concepts

derived from this dogmatism include the belief in spontaneous generation, and the dichotomy of the mind and the body—the latter concept practically persisting to this day. Against dogmatism, empiricism argues that prejudicial philosophy does not contribute positively to epistemology.

35. Levey, *Early Arabic Pharmacology*, pp. 5-7.

36. Dols, *Medieval Islamic Medicine*, pp. 3-5: "Syriac (or neo-Aramaic) speaking Christians, mainly the Nestorians [translated p]hilosophic and scientific works in Greek and Sanskrit . . . into Syriac and Pahlavi." See also Levey, *Early Arabic Pharmacology*, pp. 30-31. Others deny that any solid evidence exists for Syriac translations of Sanskrit. But see last sentence of the next note.

37. Levey, *Early Arabic Pharmacology*, p. 63. For direct confirmation of Indian-Arabic interactions, for example, see Dols, *Medieval Islamic Medicine*, pp. 15-16: "[H]undreds of names of simple and compound drugs, not known to the Greeks, were added from Persian and Indian sources." See also Ullmann, *Islamic Medicine*, pp. 17-18: "[A Persian work preserved in about twenty-five Arabic fragments deals] partly with drugs originating in India and unknown to the Greeks, as for example marsh nut (*Semecarpus anacardium*) and banana (*Musa paradisiaca*). . . . The book must . . . have risen where the lines of transmission from India and Greece intersected . . . presumably Sasanid Iran"; *ibid.*, pp. 18-19: "[In] a work quoted by al-Razi . . . Indian drugs are mentioned. . . . Under Khosrau I, the Persian doctor Burzoe . . . traveled to India whence he brought back . . . medical books. . . . [I]n the ninth century . . . Indian doctors were also practicing at the caliph's court. . . . The Caraka-Samhita, a [n Indian] medical compendium . . . was . . . first translated from the Indian into Persian and then translated further into Arabic"; *ibid.*, pp. 20-21: "[T]he Arabs were influenced . . . by the Greeks, the Syrians, the Persians and the Indians [even though] the most important component . . . was Greek medicine." In a sense, therefore, it is irrelevant whether Sanskrit texts were actually translated into Arabic; what really counts is that there seems to be incontrovertible proof of some Indian influence on Arabic medicine, and the empiric nature of that influence may have contributed to the questioning of at least some Galenic dogmatisms.

38. Levey, *Early Arabic Pharmacology*, p. 11. As to a putative direct Chinese influence on Armenian medicine, I have recently submitted to the Archives of the Somnatiave Society a voluminous manuscript which unequivocally proves that Prince Man-kun, claimed to have been the founder of the Mamikonian Armenian noble family, brought to Armenia, hidden under his shirt, a few choice Chinese medical treatises. These saved his life on numerous occasions by blocking the hundreds of arrows treacherously slung at him by pursuing soldiers sent after him by his slanderer and treacherous brother Man-chu. Man-kun translated into Armenian these Chinese texts as an exercise to improve his command of his adoptive language. This is then the mechanism by which Chinese medicine directly influenced Armenian medicine.

39. K. W. Butzer, "Physical Conditions in Eastern Europe, Western Asia and Egypt before the Period of Agricultural and Urban Settlement," *The Cambridge Ancient History*, vol. I, pt. 1 (Cambridge: Cambridge University Press, 1980) pp. 44-45.

40. It is often stated that agriculture was "born" at or near the estuarine areas of Euphratic and Tigrine confluency; but the Mesopotamian agriculture was already highly developed, needing elaborate protection from flooding, using already evolved strains of botanicals and the like. I find it reasonable to postulate that this "early agriculture" must have been preceded by a "primitive agriculture," which would be likely to occur in places meeting many or all of the following requirements: (i) existence of a naturally rich, e.g., volcanic soil that would allow easy growing of desirable species; (ii) simultaneous existence, in the wild, of *Triticum aegilopoides*, or wild einkorn, *T. dicoccoides*, or wild emmer, and *Hordeus spontaneum*, or wild barley (native growth would obviate, at least

initially, the need for artificial additions of water, fertilizer, and so on); (iii) existence of suitable materials, e.g., obsidian, to obtain tools able to perform so-called "pre-agricultural tasks," that is, tasks with potential for "indirect agricultural benefits," e.g., reaping sheets to make litters; (iv) existence of natural dwellings, e.g., caves, near the place where the desirable wild plants are growing; (v) performance of ordinary daily chores which would subsidiarily result in "direct agricultural benefits," e.g., rounding of grazing animals, and other similar activities affecting natural plant beds, with the consequent relative enrichment of such areas with useful plant species; (vi) opportunities to observe "natural agricultural events," i.e., events that can be witnessed in areas of wild growth, e.g., the observation that plants are destroyed by drought unless salvaged by rain (leading eventually to the "invention" of irrigation); (vii) topographical proclivities, e.g., hilly terrain that encourages the follow-up of such observations of natural events, e.g., total or partial diversion of mountainous streams that are effortlessly drifting downslope for irrigational purposes; (viii) opportunities to observe accidental events with agricultural potential, e.g., carrying reaped sheets for litter, dropping grains at the entrance of the cave, on receptive soil, and noticing the growth of these seeds (may lead to the "invention" of sowing); or observing that the seeds grow in certain areas (black soil, sunny exposure) but not in others, and subsequent correlation between these parameters and growth or lack of growth; (ix) opportunities to create "semi-voluntary agricultural events," e.g., pulling certain plants ("invention" of the concept of "weed") to obtain access to desirable species; (x) existence of further opportunities conducive to agricultural improvements, e.g., abundance of wildlife, taming of certain wildlife species, pastoral transhumance, particular richness of wild flora. To my knowledge, only southeastern Armenia and mountainous Iran (Kurdistan) fulfilled all the above requirements during the last postglacial period. These sites possess the additional advantage of being adjacent to Mesopotamia, the postulated site of "early agriculture," thus allowing for the likely scenario according to which "primitive agriculture" was "invented" in Armenia and Kurdistan to be later "transported to" and improved upon in Mesopotamia, through the invention and application of novel techniques, e.g., ploughing, seeding in plots, enriching the soil with alluvium and other fertilizers, irrigating, protecting the fields from floods, rotating the crops.

40. Xenophon *Anabasis* 4.5.25, where the term "barley wine" is used to connote "beer," suggesting that the latter beverage was unknown to the Greek contemporaries of Xenophon.

42. Levey, *Early Arabic Pharmacology*, p. 7.

43. Luwians, Hittites, Urartians, Hurrians, etc.; see I. M. Diakonoff, *The Pre-History of the Armenian People*, L. Jennings, trans. (Delmar, N.Y.: Caravan Books, 1984), pp. 4-11.

44. Amirdovlat' says that he has consulted Armenian medical sources attributed to Mkh'itar (Herats'i), Aharon, Step'anos, Choslin, Sargis, Hakob, Deghin, Simawon, and Vahram; see Basmajian, *Amirdovlat'i*, p. iv; but not Barkhudar (16th century!), his son Asar, his grandson Bedros, and Mik'ayël—all erroneously listed in Enézien, *Les connaissances*, p. 81, as sources used by Amirdovlat', on the basis of names found in a later colophon of the British Museum MS 3712.

45. These are short alphabetical listings of simple drugs and their translation in various languages. They obviously suffer from the idiosyncrasies of their authors. For example, Maimonides in his *Sharh asma al-'uqqa* (Explanation of Drug Names) uses expertly Syriac, Andalusian, old Castilian, and Berber, while his knowledge of classical Greek and Persian is fraught with errors (Levey, *Early Arabic Pharmacology*, pp. 148-149).

46. Alphabetical listings of simple drugs with sometimes detailed information about their properties and uses.

47. Medical formularies, called *aqrabadhin* by the Arabs, are systematic compilations and descriptions of compound drugs, themselves obtained by mixing, in various proportions, simple drugs; they were usually organized according to the pharmaceutical forms of the compound preparations, e.g., cathartics, pills, infusions, syrups, gargles, clysters, cataplasms, and unguents (Levey, *Early Arabic Pharmacology*, p. 72).

48. These were often quite sizable treatises on one or more of the various medical disciplines, e.g., anatomy, physiology, hygiene, gynecology, ophthalmology.

49. It is quite possible, of course, that the title and even the content of the original manuscripts or their faithful copies may have been purposely altered by copyists over the centuries, for the purpose, for example, of creating more attractive and more sellable volumes to Armenian medical practitioners.

50. Acharian, *Hayots'*, p. 126.

51. A. Ktsoyan, *Haykakan Sovetakan Hanragitaran*, Vol. 1 (Erevan: ASSR Academy of Sciences, 1974), pp. 321-322.

52. *Akhrapatin* (Formulary) and *Bar ew patmut'iwn meknats amenayn ts'awots'* (Nomenclature and Commented Presentation of All Ills).

53. Siruni, *Bolis*, p. 262; Eganyan, *Ts'uts'ak*, Vol. 2, p. 827.

54. Siruni, *Bolis*, pp. 197, 262.

55. All references to extant manuscripts provide the present location of the codex, its date of composition, and, if known, its provenance.

56. Erevan MSS 413 (1635, Izmir), 414 (1626, Marzuan), 454 (18th c.), 461 (1691, Surat'), 2850 (18th c.), 2947 (18th c.), 3060 (1802 [Eganyan, *Ts'uts'ak*, Vol. 1]); 5847 (1629), 6232 (19th c.), 6233 (1831-1834, Tiflis), 6242 (18th c.), 6275 (17th c., Georgia?), 6441 (1775, Erevan), 6443 (18th c.), 6718 (18th c., Georgia?), 6872 (17th c.), 7049 (17th c.), 7752 (1754, Karin), 7872 (19th c.), 8104 (1615, 1621, Tigranakert), 8871 (1459, Constantinople), 8873 (1625, 1828), 9226 (17th c.), 9790 (18th c.), 9801 (17th c.), 9803 (19th c.), 9837 (1676), 10019 (17th c., edited), 10134 (1874, Hachen), 10277 (1613?, 1711, 18th c., Sebastia [Eganyan, *Ts'uts'ak*, Vol. 2]).

57. Ktsoyan, *Haykakan*, p. 321; S. Vardanian, *Bzhshkut'iwnë hin ew mijnadaryan Hayastanum* (Erevan, 1982), pp. 42-43.

58. I know only of Erevan MS 8871 to certainly contain this work.

59. Erevan MSS 413 (1635, Izmir), 454 (18th c.), 2850 (18th c.), 3060 (1802 [Eganyan, *Ts'uts'ak*, Vol. 1]); 6233 (1831-1834, Tiflis), 6234 (1783, Kanch'ay), 6817 (16th c., Georgia?), 6872 (17th c.), 7453 (1802), 7944 (17th c.), 8104 (1615, 1621, Tigranakert), 8871 (1459, Constantinople), 9094 (1785, Erevan), 9801 (17th c., fragment), 9844 (17th c.), 9845, 9868 (17th c. [Eganyan, *Ts'uts'ak*, Vol. 2]).

60. Erevan MSS 414 (1626, Marzuan), 453 (17th c. [Eganyan, *Ts'uts'ak*, Vol. 1]); 5847 (1629), 6275 (17th c., Georgia?), 6642 (1681), 9107 (Araratean K'aghak'), 9837 (1676), 10277 (1631?, 1711, 18th c., Sebastia), 10288 (17th c. [Eganyan, *Ts'uts'ak*, Vol. 2]).

61. Siruni, *Bolis*, p. 267.

62. Erevan MSS 8871 (1459, Constantinople), 9837 (1676), 9845 (1662, 1791, 19th c. [Eganyan, *Ts'uts'ak*, Vol. 2]).

63. Erevan MS 266 (Eganyan, *Ts'uts'ak*, Vol. 1) is dated 1468, and was written by Amirdovlat' Amasiats'i, a certain T'oros, and other unknown copyists; it was written for a certain Tër Grigor. It is a miscellany containing a number of literary, poetic, historical, religious, linguistic, scientific, and medical works, including translations from Aristotle, Dion, Galen, and Rhazes.

64. Erevan MSS 266 (1468), 4286 (1747, Constantinople [Eganyan, *Ts'uts'ak*, Vol. 1]); 9226 (17th c. [ibid., Vol. 2]).

65. Siruni, *Bolis*, p. 263.

66. Ktsoyan, *Haykakan*, p. 321; S. Malkhasiants', *Amirdovlat' Amasiats'i. Ōgut Bzhshkut'ean* (Erevan, 1940).

67. Erevan MSS 414 (1626, Marzuan), 453 (17th c. [Eganyan, *Ts'uts'ak*, Vol. 1]); 5847 (1629), 6887 (18th c.), 7731 (1783, Khosrowagiugh and Salmast), 7752 (1754, Karin), 8052 (1772, Ėjmiatsin), 9226 (17th c.), 9467 (17th c.), 9665 (17th-19th cc., fragments), 9837 (1676), 9844 (17th c.), 10277 (1631?, 1711, 18th c., Sebastia), 10288 (17th c. [Eganyan, *Ts'uts'ak*, Vol. 2]).

68. Acharian, *Hayots'*, p. 127.

69. Acharian, *Hayots'*, p. 126; Siruni, *Bolis*, p. 264, states that the book was translated from Turkish; however, Ktsoyan, *Haykakan*, asserts that the original language was Arabic.

70. Vardanian, *Bzhshkut'iwnē*, p. 46.

71. Enézia, *Les connaissances*, p. 84.

72. *Ibid.*, p. 81.

73. Siruni, *Bolis*, p. 321. The Armenian spelling of the word Ėramadanin does not allow to distinguish between the Arabic *dal* and *dad*. Thus, two possibilities exist initially: (i) that Amirdovlat' was nicknamed Ramadan, a common Arabic name in his Muslim environment; or (ii) that he was an eye doctor (the Arabic term acquires this meaning when written with a *dal*). I prefer the latter explanation for the following reasons: (i) The word, as spelled in Armenian, is not capitalized; (ii) the surname Ramadan is a holy one, after the fasting month of Ramadan, and Muslims would not tolerate its use by a Christian; and besides, (iii) Amirdovlat' is an Arabic name to begin with.

74. Bibliothèque Nationale de Paris MS 108, at least according to Enézia, *Les connaissances*, p. 81.

75. Acharian, *Hayots'*, p. 126. I have taken the liberty of calling the formulary written in 1459 "First," and the one written in 1481 "Second." This chronological order is a rational one and, if generally adopted, will clear the considerable confusion generated by scholars trying to distinguish between Amirdovlat's two significantly different formularies.

76. Many authors appear to be confusing "entry" and "simple." A formulary usually has more of the former than the latter inasmuch as a given "simple" may result in numerous "entries" due, for example, to synonyms, or to various names of drugs when obtained from different parts of the same plant.

77. Ktsoyan, *Haykakan*, p. 321; Enézia, *Les connaissances*, p. 80.

78. The following are certainly ascribable to the second Formulary: *Akhrapatin ēst Musa-bin-Maymuni*, Erevan MSS 6635 (18th c.), 8873 (1625, 1628), 10277 (1631?, 1711, 18th c., Sebastia [Eganyan *Ts'uts'ak*, Vol. 2]). For manuscripts entitled *Akhrapatin*, or *Akhrapatin (A-K')*, see nn. 59 and 60, respectively.

79. Erevan MS 10277 (1631?, 1711, 18th c., Sebastia [Eganyan, *Ts'uts'ak*, Vol. 2]).

80. Siruni, *Bolis*, p. 267.

81. The work entitled "Medical Terms" can be found in Erevan MSS 413 (1635, Izmir), 459 (1692-1696, Van), 2794 (1667, Nor Jughay), 2850 (18th c. [Eganyan, *Ts'uts'ak*, Vol. 1]); 6722 (17th-18th cc.), 7749 (17th c.), 8052 (1772, Ėjmiatsin), 10288 (17th c. [Eganyan, *Ts'uts'ak*, Vol. 2]). The one entitled "Potency of Medicaments" can be found in Erevan MSS 412 (17th c.), 461 (1691, Surat'), 2850 (18th c.), 4607 (1795, Tigranakert [Eganyan, *Ts'uts'ak*, Vol. 1]); 6233 (1831-1834, Tiflis), 6242 (18th c.), 6441 (1775, Erevan), 6443 (18th c.), 6872 (17th c.), 7749 (17th c.), 8408 (18th c., Aleppo), 9801 (17th c.), 9803 (19th c.), 9837 (1676), 10277 (1631?, 1711, 18th c., Sebastia [Eganyan, *Ts'uts'ak*, Vol. 2]).

82. See, Riddle, *Dioscorides*; and Levey, *Early Arabic Pharmacology*, pp. 100-103. The presence of lists in the earliest known Sumerian, Akkadian, and Hittite tablets suggests that such lists were already used during the period of oral transmission of knowledge. This is not at all surprising given their well-known mnemotechnical value.

83. Ibid., p. 67.

84. See Mkhitar Herats'i, *Jermants' mkhit'arut'iwn* (Venice, 1832), the title of which is an obvious pun on the author's name. And what is one to make of Al-Antaki's *Tadhirat uli albabwajami al-ajab al-ujab* (Memorandum for Intelligent People [see Levey, *Early Arabic Pharmacology*, p. 170])? Given that humorous titles are extremely rare in Arabic textbooks, is it at all conceivable that the latter author, who died in 1599, was influenced by the "Useless to the Ignorant" of Amirdovlat'?

85. Basmajian, *Amirdovlat'i*; L. Bézanger-Beauquesne et al., *Les plantes dans la thérapeutique moderne* (Paris: Maloine, 1975); and G. Mēnevishian, *Busabanut'iwn* (Vienna, 1897).

86. This listing is in preparation for publication.

87. W. H. Lewis and M. P. F. Elvin-Lewis, *Medical Botany* (New York, N.Y.: Wiley-Interscience, 1977); L. M. Perry and J. Metzger, *Medicinal Plants of East and South-east Asia* (Cambridge, Mass.: MIT Press, 1980); van Steenis-Kruseman, "Select Indonesian Medicinal Plants," *Organic Sciences Research Indonesia Bulletin*, 18 (1953), 31; G. E. Trease and W. C. Evans, *Pharmacognosy* (London: Bailliere-Tindall, 1978); and V. E. Tyler et al., *Pharmacognosy* (Philadelphia, Pa.: Lea and Febiger, 1981).

88. Basmajian, *Amirdovlat'i*, p. 10.

89. E. Block, "The Chemistry of Garlic and Onion," *Scientific American*, March 1985, pp. 114-119.

90. Basmajian, *Amirdovlat'i*, entries 2714, 2785.

91. Bézanger-Beauquesne et al., *Les plantes*, p. 63; Perry and Metzger, *Medicinal Plants*, p. 232; and van Steenis-Kruseman, *Select Indonesian Medicinal Plants*.

92. Perry and Metzger, *Medicinal Plants*, p. 232.

93. B. Ebbell, trans., *The Papyrus Ebers, the Greatest Egyptian Medical Document* (London: Oxford University Press, 1937).

94. Tyler et al., *Pharmacognosy*, p. 483.

95. J. S. Goodwin and J. M. Goodwin, "Failure to Recognize Efficacious Treatments: A History of Salicylate Therapy in Rheumatoid Arthritis," *Perspectives in Biology and Medicine*, 31 (1981), 78-92.

96. Basmajian, *Amirdovlat'i*, entries 2507, 2508, 2470, 3408.

97. M. Windholz et al., *The Merck Index* (Rahway, N.J.: Merck & Co., 1983), p. 357.

98. Bézanger-Beauquesne et al., *Les Plantes*, pp. 177-178; Perry and Metzger, *Medicinal Plants*, p. 415.

99. Erevan MSS 411 (1745, Tp'khiz), 414 (1626, Marzuan), 456 (17th c.), 457 (1657, Tkat), 460 (1682, Ancyra), 2738 (1789, Erevan), 3198 (17th c. [Eganyan, *Ts'uts'ak*, Vol. 1]); 6232 (19th c.), 6234 (1783, Kanchay), 6242 (18th c., edited), 6275 (17th c., Georgia?), 6286 (1826, Tiflis), 6443 (18th c.), 6460 (19th c.), 6642 (1681), 7352 (1786-1787, Tiflis), 7453, 7752 (1754, Karin), 7844 (17th c.), 8048 (1808), 8811 (17th c.), 9193 (17th c.), 9259 (1748, Ewtogia), 9388 (17th c.), 9822 (17th c., Ewtogia), 10019 (17th c., edited), 10277 (1631?, 1711, 18th c., Sebastia [Eganyan, *Ts'uts'ak*, Vol. 2]). Bibliothèque Nationale de Paris MSS 244 (fragment), 247, 249 (fragment), 257 (Basmajian, *Amirdovlat'i*, p. xii). Mekhitarist of Vienna MSS 624 and 625; St. James of Jerusalem MS, without a number given; and Antonian Library of Constantinople MS, without a number but stated to be defective (ibid.).

100. Basmajian, *Amirdovlat'i*, p. 232.

101. Ibid., p. 381.

102. Ibid., p. 34.

103. Ktsoyan, *Haykakan*, p. 321.

104. *Federal Food, Drug, and Cosmetic Act, as Amended, and Related Laws* (Rockville, Md.: U.S. Dept. of Health and Human Services, 1985), publication no. (FDA)86-1051.

105. Basmajian, *Amirdovlat'i*, p. 3.

106. Ibid.

107. These difficulties persist to this day. Modern experts, for example, have a difficult time deciding whether a noncaloric substitute of cooking fat is a food or drug.

108. This notion seems to have been first enunciated by Theophrastus and later elaborated by Galen.

109. Basmajian, *Amirdovlat'i*, p. 3.

110. Ibid., p. 4.

111. Ibid., p. 5.

112. Ibid., p. 4.

113. Ibid.

114. Ibid., p. 9.

115. For an illustrative example, see V. Ramalingam et al., "Liv. 52 Studies in Acute Hepatitis," *Medicinal Plants*, Vol. 1 (New York, N.Y.: MSS Information Corp., 1974), pp. 10-13.

116. Dols, *Medieval Islamic Medicine*, p. 9.

117. Ibid., pp. 15-16.

118. Ibid., pp. 23, 63.

119. Adnan, *La science*, p. 37.

120. Basmajian, *Amirdovlat'i*, p. 2.

121. In an interesting comparison, the scientific works of Maimonides were written in various languages but not in either Hebrew or Aramaic while his biblical commentaries were written in his language of origin.